

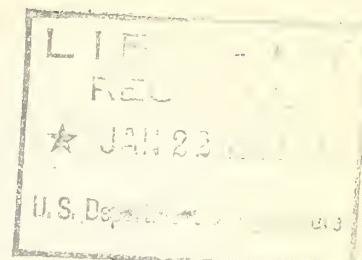
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United States Department of Agriculture
Bureau of Animal Industry
Animal Husbandry Division

FACE COVERING IN RANGE SHEEP



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Many range sheep, particularly those of Rambouillet breeding, have wool covering over most of the face. This covering of wool on the face has usually been associated with wool covering on the legs, which may have some protective value. While the actual wool grown on the face and legs adds little if any value to the fleece, it has long been thought that covered faces were associated with a heavy weight of fleece. In recent years it has become apparent that heavy covering of wool on the face was not necessarily indicative of heavy fleece weight. Spencer et al (1) published data on wool production in 1928 showing that Rambouillet ewes with the barest faces had heavier fleece weights, both unscoured and scoured, than those having heavily covered faces.

Range sheep producers in general favor a type with an open face. Sheep with heavily covered faces have to be clipped around the eyes at least 2 or 3 times per year to prevent wool blindness. These sheep may be wool-blind for part of the year and consequently do not do so well as others. They are more apt to be lost from the band and may die because of lowered resistance and vitality due to partial starvation or lack of water.

Wool on the face is undesirable where lambs go into the feed lot. Wool-blind lambs are timid in the feed lot and are probably not able to feed so well as lambs with open faces. Feeders of western lambs prefer lambs with open faces and find that in the case of those with covered faces it is necessary to keep the wool around the eyes clipped in order to obtain good gains.

Wool grown on the face and legs is of questionable commercial value. This wool may be short, is often stained and is apt to be contaminated with burs, foxtail, chaff, and other foreign matter. Second cuts are often made on the face around the eyes and ears. Wool sheared from the face is apt to be loose and is often lost from the fleece or left with the tags.

Literature on the inheritance of head furnishings has been reviewed by Miller (2). General agreement on the mode of inheritance of face covering is lacking. Ritzman (3) studied crosses of the Rambouillet with the Southdown, Hampshire, Oxford, and Dorset. He found that there was no simple dominance either for heavy, light, or for entire lack of wool on the face, ears, and on the lower part of the legs. He also found a general correlation between fineness of wool and the degree to which it covers the extremities.

The objects of these investigations were to determine the relationship of face covering to factors of economic importance in sheep production; to obtain information on the variation of degree of face covering; to learn more concerning the inheritance of face covering; and to formulate a breeding program for rapidly fixing the open face character in range sheep.

Material and Methods

This study involved records of scores for face covering and wool and lamb production of sheep in the Rambouillet flock of the Western Sheep Breeding Laboratory and U. S. Sheep Experiment Station, Dubois, Idaho. Data on 389 yearling Rambouillet ewes born in 1938 and 1939 from 21 sires having 10 or more daughters in both years were used. Data on offspring from Rambouillet rams crossed with unregistered Corriedale ewes and from Targhee matings were also used. Weanling data were taken from all Rambouillet lambs born in one band in 1938, 1939, and 1940. In addition the relation of face covering to lamb production was determined from lifetime data on Rambouillet ewes born from 1925 to 1934, inclusive.

Wool covering on the face was scored as follows: "1" not covered beyond the poll, "2" covered to the eyes, "3" covered slightly below the eyes but with open face or not subject to wool blindness, "4" covered below the eyes, but not entirely covered and subject to wool blindness, "5" almost or entirely covered and subject to wool-blindness. Scores 3, 4, and 5 are most common in Rambouillets and are illustrated in plate 1. Faces scored as 3, 4, and 5 are referred to as open, partially covered, and covered, respectively. Faces which are bare to the poll and back of the eyes, scoring "1" and "2", respectively, are classified as open-faced but are very rare in Rambouillets. The degree of face covering described for a score of 3 is thought to be most desirable for range sheep. Yearling scores were used for dam-daughter comparisons. Rams were scored each year and the score most representative of the lifetime scores was used.

Other measures and scores include body weight in pounds which was taken just after shearing at yearling age. Unscoured fleece weight was taken on the shearing floor to the nearest 0.05 pound. The scoured weight of fleece was determined by multiplying grease weight by percent of yield. Percent of yield is the percent of bone-dry, clean wool scoured from a representative sample of the fleece. Fleece length was measured at the middle of the side to the nearest 0.2 centimeter. Neck folds were scored as follows: "1" no folds, "2" very few folds of small or moderate size, "3" folds of moderate number or size, "4" heavy folds of moderate or large number, "5" completely covered with heavy folds. Fineness was determined by estimating mean diameter from projected cross sections.

Scores for face covering and neck folds and measurement of fleece length were taken by each of a committee of three qualified judges and averages of the three were used for the values assigned to each animal. Values in the better 1/3 and poorer 1/3 of each score have been indicated by plus and minus signs and have been assigned a deduction of 0.33 and an addition of 0.33, respectively. Thus, a sheep scored in the better one-third of 3 has a numerical value of 2.67 and one in the poorer one-third of 3 has a numerical value of 3.33. Measurements of unscoured and scoured fleece weight and fleece length have been adjusted to 365 days' growth.



Plate 1. Faces of Rambouillet sheep showing various degrees of wool covering.

A to C, open faces, scored as 3;
D to F, partially covered faces, scored as 4;
G to I, covered faces, scored as 5.

Determination of lamb production has been based on the pounds of lambs weaned per ewe year. This was obtained by dividing the total weight of lambs weaned at about 130 days by the number of years the mothers were in the flock.

All ewes included in this study which were subject to wool blindness have had the wool clipped from around the eyes several times a year. Thus, differences between those subject to wool blindness and those not subject to wool blindness have come about in spite of this corrective treatment.

Results

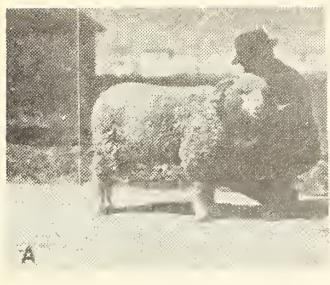
The majority of the Rambouillet yearling ewes included in this study were subject to wool blindness. Only 10.5 percent had open faces, 34.2 percent had partially covered faces and 55.3 percent had covered faces. Yearling ewes born in 1938 and 1939 have been combined for this study as there was practically no difference between the two groups in regard to face covering.

Limited observations on the relation of wool covering on the face to wool covering on the legs have been made and the relationships are illustrated in plate 2. Rambouilllets with more covering on their faces tended to have slightly more wool on the legs although those with open faces had wool on the legs well below the knees and hocks.

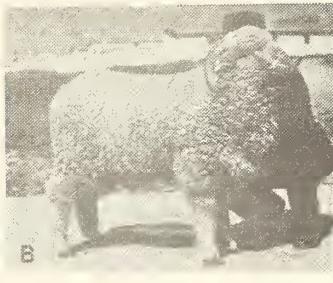
Relationships of face covering to fleece production are shown in table 1. There was a slight tendency for an increase in unscoured fleece weight to be associated with an increase in wool covering over the face but much of the difference disappeared when fleece weights were considered on a scoured basis. There was no definite relationship between face covering and fleece length or fleece fineness. Correlation coefficients between face-covering score and unscoured fleece weight, scoured fleece weight, fleece length and fleece fineness were 0.12, 0.01, -0.04, and 0.07, respectively. The coefficient between face covering and unscoured fleece weight was barely significant.

Table 1.--Relationship of face covering to fleece production of yielding Rambouillet ewes, weights and length being adjusted to 365 days

Face cover-	: Unscoured fleece	: Scoured, bone dry fleece	: Fleece length	: Fleece fineness
ing	: weight	: weight	: at side	
	: No. : Average	: No. : Average	: No. : Average	: No. : Average
	: head :	: head :	: head :	: head : diameter
	- - Lbs.	: : Lbs.	: : Cm.	: : Microns
Open face	: 41 : 8.69	: 38 : 2.93	: 41 : 5.68	: 19 : 19.58
Partially cov-	:	:	:	:
ered face	: 132 : 8.81	: 123 : 2.99	: 132 : 5.76	: 58 : 19.79
Covered face	: 215 : 9.06	: 182 : 2.93	: 215 : 5.61	: 116 : 19.91



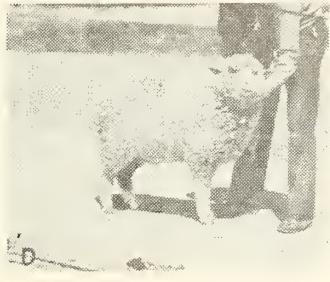
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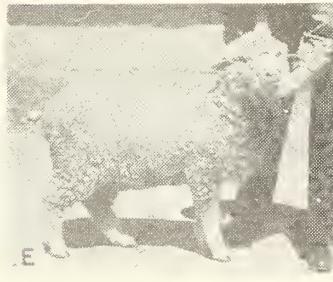
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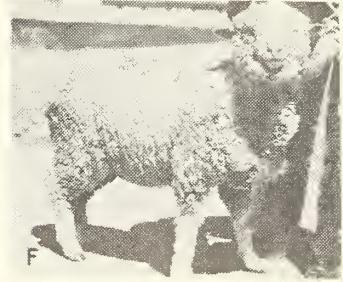
C



D



E



F

Plate 2. Rambouillet sheep showing degrees of wool covering of faces and legs

A and D, ram and ewe with open faces;
B and E, ram and ewe with partially covered faces;
C and F, ram and ewe with covered faces.

There was a tendency for lighter body weights to be associated with a more covered face. Ewes with covered faces averaged 83.7 pounds, while ewes with partially covered faces averaged 86.1 pounds and ewes with open faces averaged 88.3 pounds at yearling age after shearing. The correlation coefficient between face covering and body weight of -0.15, although low, was significant.

There was a very slight increase in degree of neck folds with a more covered face as shown by the correlation coefficient of 0.11 which was barely significant.

The effect of degree of face covering on lamb production is shown in table 2. These data include the lifetime lamb production of all registered Rambouillet ewes born at this Station from 1925 to 1934 which left the flock because of death, because they were missing, or because they were culled for age. Ewes culled for other reasons were not included because more of them had covered and partially covered faces, and these were culled on the average of about a year younger than those having open faces. In lamb production the ewes with open faces excelled those groups which were subject to wool blindness. Ewes with open faces produced $8.6 \pm 1.1^*$ more pounds of lamb per ewe year than ewes with covered faces and $4.4 \pm 1.2^*$ more pounds of lamb than ewes with partially covered faces. This was mainly due to a higher percent of lambs born and weaned from the ewes with more open faces, although there was also an advantage of nearly a pound in weaning weight. These differences may be attributed to the detrimental effects of wool blindness in both the ewe and the lamb, as it will be shown later that open-face ewes are more apt to have open-face lambs and covered-face ewes are more apt to have covered-face lambs. Also these differences occurred in spite of periodic shearing around the eyes of all ewes subject to wool blindness. More recent data of a limited nature have shown somewhat greater advantage in lamb production for ewes with open faces.

Table 2.--Relation of face covering to lamb production

Face cover-	: No.	: Average:	Total:	No. lambs:	Average:	Wt. of lambs	
ing	: of	: lambing:	lambs:	born per	: weaned	: weaning:	weaned per
	: ewes	: years	: born	: 100 ewe	: per 100	: weight	: ewe year
	: per ewe:	: years	: ewe years:				
	:	:	:	:	:	Lbs.	Lbs.
Open face	: 117	: 4.1	: 570	: 118	: 91	: 70.4	: 63.9
Partially cov-							
ered face	: 138	: 4.4	: 670	: 110	: 83	: 69.5	: 59.5
Covered face	: 138	: 4.0	: 593	: 107	: 79	: 69.6	: 55.3

There appeared to be sex differences in face covering as shown in table 3. It was necessary to make this comparison on lambs at weaning age as this was the latest date that comparable populations of rams and ewes were available. All lambs weaned from one band of Rambouilletts for the 3-year period of 1938 to 1940 were included. At weaning age ram lambs had more wool covering the face than ewe lambs. The difference between the 2 groups was highly significant. Thus it appears that the wool

(*) Standard error of the mean difference.

covering on the face of a ram grows and develops at an earlier age than on the ewe. Limited observations on rams scored each year of their life for face covering fail to show any definite change with age from the weanling score. Previous work* has shown that ewes have more wool covering on the face at yearling than at weanling age. This work is further sustained by comparing data in table 3 with the distribution for yearling ewes given in the first paragraph of the results, which shows a shift toward more covered faces in the yearling as compared with the weanling ewe.

Table 3.--Sex differences in face covering of weanling Rambouillet lambs

Face covering	Male lambs		Female lambs	
	No.	Percent	No.	Percent
Open face	54	6.5	154	16.3
Partially covered face	336	40.4	498	52.9
Covered face	441	53.1	290	30.9
Total	831		942	

It has been noted in making selections for breeding that ewes with open faces appeared to be present in greater proportion than rams with open faces. This would support the view that the sex difference is not entirely a result of difference in age of development of face covering. However, rams are selected much more rigidly than ewes and the chances that a Rambouillet ram with an open face will also be acceptable for all other requirements is quite low. In the case of ewes where selection is necessarily very limited nearly all ewes with open faces are retained for breeding and are kept in the flock as long as possible.

In planning a breeding program to increase the open-face character in the Rambouillet flocks it is important first to obtain information on the heritability of the open-face character. The relations between the parents and the offspring are shown in table 4 by the coefficients of correlation and regression. All coefficients are positive and highly significant. An estimate of heritability as suggested by Lush (4) may be obtained by doubling the within-sire regression of daughters on dams of 0.22 which indicates that 44 percent of the variance between face covering scores of mates to a sire was due to additively genetic differences between those ewes, but possibly including a small part of epistatic differences. There had been some selection for open face among the dams particularly to one sire. There had been practically no selection among the daughters. The daughters of each sire were less variable than their dams. The estimate of heritability of face covering appears to be relatively high which indicates that, in general rams and ewes that show this character have a tendency to transmit it. Thus, selection based largely on the appearance of the face of the animal should be adequate to increase effectively the open-face character in Rambouilletts.

The correlation coefficient of 0.14 between sires and dams in table 4, although low, shows a tendency for like to be mated to like. This was probably largely due to the fact that nearly half of the rams included were related to part or all of the ewes to which they were mated and in one case both ram and ewes were selected for open face. The standard partial regression coefficient of daughters on dams independent of sires was 0.34 as compared with 0.35 for daughters on sires independent of dams. The similarity of these beta coefficients shows that the sire and dam appear

(*) Unpublished data presented at the meeting of the Western Section, American Society of Animal Production, Bozeman, Mont., June 27-28, 1940.

to be practically equal in transmitting the factors for degree of face covering to their daughters. In other words the expected equality of the effect of sire and dam on the offspring has not been disturbed by environment, or by deficiencies in the method of evaluating the character.

It is recognized that, in the animals studied, all gradations in face covering, from a face bare of wool to the eyes to one completely covered with wool occurred. The system of scoring used allows for about 9 to 12 different distinctions in degree

Table 4--Relation between face covering of parent and offspring
as indicated by coefficients of correlation and regression

Relationship	: Degrees of	: Correlation	: Regression
	: freedom	: coefficient	: coefficient
Daughters with dams	: 388	: 0.39	: 0.26
Daughters with dams within sires	: 368	: 0.35	: 0.22
Daughters with sires	: 388	: 0.39	: 0.62
Dams with sires	: 388	: 0.14	: 0.34

of face covering in the type of sheep being studied. While it has previously been shown that face-covering score is a repeatable measure as scores taken at weaning were fairly reliable in indicating the face covering score of the yearling animal, it must be admitted that a considerable portion of the variance of face covering of dams not due to heredity is probably due to the impossibility of exactly measuring face covering by scores. For this reason many of the comparisons used in this study are based on rather rough grouping of the animals involved into three classes on a basis of their face covering scores as is illustrated in plate 1.

Data on the results of matings involving sheep with various degrees of face covering are not yet complete. Preliminary observations show that Rambouilletts with open faces mated to Rambouilletts with open faces yield offspring about half with open faces and half with partially covered faces. Animals with partially covered faces mated with each of the three types produced offspring of all three types, although in every case there were more with covered faces than with open faces. Intermating of animals having covered faces produced similar progeny in practically all cases. It is difficult to determine from these data the number of genes involved in the inheritance of face covering in Rambouilletts. It appears that the gene pattern may not be very complicated. This would be particularly true if there are modifying factors present which seems likely in view of the large number of gradations in face covering which exist. These gradations have been minimized in this study due to the simplified groupings which have been used. Open face appears to have dominance over covered face but the results are inconclusive as yet.

Data on Rambouillet--Corriedale crosses and Targhee mating show that the open-face character of the crossbred type such as the Corriedale is dominant over the covered face of the Rambouillet.

Available records show that the foundation stock for the Rambouillet flock studied here was composed largely of sheep with covered faces. It is not surprising that the process of changing this situation to one in which the majority of sheep will

have open faces has been and will be slow. It seems probable that the gene or genes for open faces have been quite rare in this flock. Progress should be increasingly rapid as more animals in the flock carry the factors for open face. The heritability of face covering would seem to be sufficiently high that selection could be based largely on the appearance of the face of the animal and that there would probably not be much need for inbreeding or progeny tests. However, the latter might be more essential when a high proportion of the sires have open faces to determine which would breed true for the character.

Summary and Conclusions

1. Variation in face covering in the Rambouillet flock of the Western Sheep Breeding Laboratory and U. S. Sheep Experiment Station is described, showing a predominance of sheep subject to wool blindness.

2. Little or no relationship has been demonstrated between face covering and unscoured and scoured fleece weight, fleece length, fleece fineness, body weight, and neck folds in these data, although there are slight tendencies for ewes with open faces to have lighter unscoured fleece weights, heavier body weights, and fewer neck folds.

3. Rambouillet ewes with open faces have a decided advantage in lamb production over ewes subject to wool blindness. Ewes with open faces produced 8.6 ± 1.1 more pounds of lamb per ewe year than ewes with covered faces and 4.4 ± 1.2 more pounds of lamb than ewes with partially covered faces.

4. Rambouillet ram lambs have more wool covering on the face at weaning time than ewe lambs. This difference is probably due to earlier development of face covering in the male.

5. Rams and ewes appear to be equal in the inability to transmit the factors for face covering to their offspring. Since the progeny tend in general to show the same type of face covering as the parents, the heritability of this characteristic is thought to be relatively high.

6. Results of matings show the possibility that inheritance of face covering in Rambouillets may not be very complicated.

References

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